What is claimed is:

[c01] 1. An extended, multi-spot x-ray source for computed tomography or volume computed tomography imaging comprising:

an electron gun capable of producing a plurality of electron beams, each electron beam focused at a predetermined distance and aimed in a predetermined direction; and

a plurality of targets positioned to receive the electron beams and generate x-rays in response thereto, each target comprising a predetermined focal spot thereon;

wherein each electron beam is synchronized to strike, at an appropriate time, a predetermined target comprising a predetermined focal spot thereon.

[c02] 2. The x-ray source of claim 1, wherein each target comprises a different focal spot thereon.

[c03] 3. The x-ray source of claim 1, wherein each electron beam is focused at a different distance.

[c04] 4. The x-ray source of claim 1, wherein each electron beam is aimed in a different direction.

[c05] 5. The x-ray source of claim 1, wherein each electron beam strikes a different target having the appropriate focal spot thereon.

[c06] 6. The x-ray source of claim 1, wherein the plurality of targets rotate about an axis of rotation.

[c07] 7. The x-ray source of claim 1, wherein a single electron beam, focused at a predetermined distance, strikes only one target, comprising a matching predetermined focal spot thereon, at a time.

[c08] 8. The x-ray source of claim 1, wherein at least one target is designed to let electron beams pass therethrough and strike another target at predetermined intervals.

[c09] 9. The x-ray source of claim 8, wherein at least one target comprises a cut-out section that allows electron beams to pass therethrough and strike another target at predetermined intervals.

[c10] 10. The x-ray source of claim 1, further comprising:

a sensing device for identifying a rotational position of the targets.

[c11] 11. The x-ray source of claim 10, wherein the sensing device comprises:

a magnetic material disposed on a rotor; and

a magnetic pick-up device disposed in close proximity to the magnetic material;

wherein when the rotor spins around its axis of rotation, the magnetic pick-up device obtains a voltage or current signal as the magnetic material passes thereby, and then the magnetic pick-up device transmits an appropriately treated and amplified signal to the electron gun to do at least one of: change electron beam focusing parameters, and make deflection corrections.

[c12] 12. The x-ray source of claim 1, wherein adjusting a focal bias voltage placed on the electron gun accomplishes at least one of: focusing at least one electron beam, and changing electron beam properties.

[c13] 13. The x-ray source of claim 1, wherein adjusting an accelerating voltage placed on the electron gun accomplishes at least one of: focusing at least one electron beam, and changing electron beam properties.

[c14] 14. The x-ray source of claim 1, wherein multi-slice images having a total thickness of up to about 160mm can be obtained in a single gantry rotation.

[c15] 15. A method for obtaining thick multi-slice images in a single gantry rotation in computed tomography or volume computed tomography, the method comprising:

providing an electron gun capable of producing a plurality of electron beams, each electron beam focused at a predetermined distance and aimed in a predetermined direction; and

providing a plurality of targets positioned to receive the electron beams and generate x-rays in response thereto, each target comprising a predetermined focal spot thereon; and

synchronizing each electron beam to strike, at an appropriate time, a predetermined target comprising a predetermined focal spot thereon.

[c16] 16. The method of claim 15, wherein each target comprises a different focal spot thereon.

[c17] 17. The method of claim 15, wherein each electron beam is focused at a different distance.

[c18] 18. The method of claim 15, wherein each electron beam is aimed in a different direction.

[c19] 19. The method of claim 15, wherein each electron beam strikes a different target having the appropriate focal spot thereon.

[c20] 20. The method of claim 15, wherein the plurality of targets rotate about an axis of rotation.

[c21] 21. The method of claim 15, wherein a single electron beam, focused at a predetermined distance, strikes only one target, comprising a matching predetermined focal spot thereon, at a time.

[c22] 22. The method of claim 15, further comprising:

providing at least one target that is designed to let electron beams pass therethrough and strike another target at predetermined intervals.

[c23] 23. The method of claim 22, wherein at least one target comprises a cut-out section that allows electron beams to pass therethrough and strike another target at predetermined intervals.

[c24] 24. The method of claim 15, further comprising:

providing a sensing device for identifying a rotational position of the targets.

[c25] 25. The method of claim 24, wherein the sensing device comprises:

a magnetic material disposed on a rotor; and

a magnetic pick-up device disposed in close proximity to the magnetic material;

wherein when the rotor spins around its axis of rotation, the magnetic pick-up device obtains a voltage or current signal as the magnetic material passes thereby, and then the magnetic pick-up device transmits an appropriately treated and amplified signal to the electron gun to do at least one of: change electron beam focusing parameters, and make deflection corrections.

[c26] 26. The method of claim 15, further comprising:

adjusting a focal bias voltage placed on the electron gun to accomplish at least one of: focusing at least one electron beam, and changing electron beam properties.

[c27] 27. The method of claim 15, further comprising:

adjusting an accelerating voltage placed on the electron gun to accomplish at least one of: focusing at least one electron beam, and changing electron beam properties.

[c28] 28. The method of claim 15, wherein multi-slice images having a total thickness of up to about 160mm can be obtained in a single gantry rotation.

[c29] 29. A computed tomography or volume computed tomography imaging system comprising:

an extended, multi-spot x-ray source for computed tomography or volume computed tomography imaging comprising:

an electron gun capable of producing a plurality of electron beams, each electron beam focused at a predetermined distance and aimed in a predetermined direction; and

a plurality of targets positioned to receive the electron beams and generate x-rays in response thereto, each target comprising a predetermined focal spot thereon;

wherein each electron beam is synchronized to strike, at an appropriate time, a predetermined target comprising a predetermined focal spot thereon; and

an x-ray detector;

wherein the x-ray source projects a multi-spot beam of x-rays towards the x-ray detector, the x-ray detector detects the x-rays, and an image is created therefrom.